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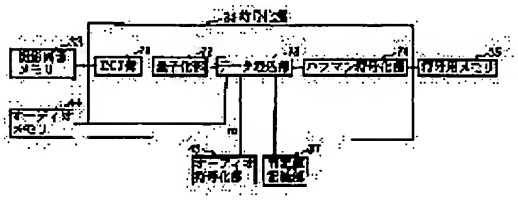
(54) IMAGE RECORDER, ITS METHOD, MEDIUM RECORDING ITS PROGRAM, IMAGE REPRODUCING DEVICE, ITS METHOD AND MEDIUM RECORDING ITS PROGRAM

(57)Abstract:

PROBLEM TO BE SOLVED: To provide an image coder and an image decoder that compress and decode a picture with other many quantities of data while suppressing increase in a data capacity and reducing deterioration in a part of the picture.

SOLUTION: A DCT section 71 generates a DCT coefficient block, a quantization section 72 generates a quantization DCT coefficient block, a data imbedding section 73 imbeds an audio bit stream to all bits of AC coefficients in a frame area, imbeds an audio bit stream to low-order bits of the AC coefficients at the outside of the frame area and a Huffman coding section 74 applies Huffman coding to an output of the section 73.



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* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

CLAIMS

[Claim(s)]
[Claim 1] Image recording equipment which is characterized by providing the following and which embeds and records other information on the image information for one screen. A field storage means by which the field information which shows some fields of one screen is memorized. A receiving means to receive the image information for one screen, and other information. The substitution means replaced with the aforementioned bit string which read the bit string of predetermined length from information besides the above, read the bit string of the aforementioned predetermined length and different length from information besides the above to the image information which is not contained to the field shown using the aforementioned field information to the image information contained to the field shown using the aforementioned field information, and read the low order digit of the image information concerned.
[Claim 2] The picture reproducer which reproduces a picture from the image information for one screen where other information characterized by providing the following was embedded, and reads other information. A field storage means by which the field information which shows some fields of one screen is memorized. A receiving means to receive the image information for one screen where other information was embedded. The read-out means which reads the bit string of predetermined length from the low order digit of the image information contained to the field shown using the aforementioned field information as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information. A reproduction means to reproduce the image information for one screen where information besides the above was embedded.
[Claim 3] The image recording regenerative apparatus which is characterized by providing the following and which embeds and records other information on the image information for one screen, reproduces a picture from the image information for one screen where other information was embedded, and reads other information. A field storage means by which the field information which shows some fields of one screen is memorized. A receiving means to receive the image information for one screen, and other information. As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information to the image information contained to the field shown using the aforementioned field information A storage means to memorize the image information for one screen containing the image information with which the substitution means replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned, and the aforementioned bit string were replaced. The picture read-out means which reads the image information for one screen where other information was embedded from the aforementioned storage means, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned

field information as other information, A reproduction means to reproduce the image information for one screen where information besides the above was embedded.
[Claim 4] The image recording method used with the image recording equipment which is equipped with a field storage means by which the field information which is characterized by providing the following, and which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen. The receiving step which receives the image information for one screen, and other information. The substitution step replaced with the aforementioned bit string which read the bit string of predetermined length from information besides the above, read the bit string of the aforementioned predetermined length and different length from information besides the above to the image information which is not contained to the field shown using the aforementioned field information to the image information contained to the field shown using the aforementioned field information, and read the low order digit of the image information concerned.
[Claim 5] The image reconstruction method used by the picture reproducer which reproduces a picture from the image information for one screen where was equipped with a field storage means by which the field information which is characterized by providing the following, and which shows some fields of one screen is memorized, and other information was embedded, and reads other information. The receiving step which receives the image information for one screen where other information was embedded. The read-out step which reads the bit string of predetermined length from the low order digit of the image information contained to the field shown using the aforementioned field information as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information. The reproduction step which reproduces the image information for one screen where information besides the above was embedded.
[Claim 6] The record medium which is recording the image recording program used by computer which is equipped with a field storage means by which the field information which is characterized by providing the following, and which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen. The aforementioned program is a receiving step which receives the image information for one screen, and other information. The substitution step replaced with the aforementioned bit string which read the bit string of predetermined length from information besides the above, read the bit string of the aforementioned predetermined length and different length from information besides the above to the image information which is not contained to the field shown using the aforementioned field information to the image information contained to the field shown using the aforementioned field information, and read the low order digit of the image information concerned.
[Claim 7] The record medium which is recording the image reconstruction program used by computer which reproduces a picture from the image information for one screen where was equipped with a field storage means by which the field information which is characterized by providing the following, and which shows some fields of one screen is memorized, and other information was embedded, and reads other information. The aforementioned program is a receiving step which receives the image information for one screen where other information was embedded. The read-out step which reads the bit string of predetermined length from the low order digit of the image information contained to the field shown using the aforementioned field information as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information. The reproduction step which reproduces the image information for one screen where information besides the above was embedded.

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* NOTICES *

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[The technical field to which invention belongs] this invention relates to the picture coding technology and picture decryption technology of using the digital-watermarking technology of making a picture hiding another information in its hand in the invisible state.
[0002]
[Description of the Prior Art] In recent years, the mass production technology of a computer is remarkable and the commercial scene is provided with the so-called highly efficient personal computer so much by the low price. Conjointly, many people use a personal computer for it, create original digital contents to it himself, and are performing information dispatch of these contents to it through the Internet. Usually, if it is called the digital contents which carry out information dispatch, there are many JPEG pictures picturized with the digital camera etc. not to mention a text. This is because information is enough told by high visual-recognition nature peculiar to human being with a still picture. Moreover, if a JPEG picture is used, a still picture is compressed, the data capacity of a still picture decreases, and management and transmission of data can be performed efficiently.
[0003] Recently, the demand that he wants to make information offer also using the acoustic sense has also increased by adding sound information to a still picture. In such a case, FlashPix etc. is used as a digital file format which added sound information to the still picture. Moreover, the method which embeds another information so much in the picture which is an incompressible file is proposed by "the picture depths enciphering method for having used the field division by complexity" (an electronic-intelligence communication society technical report besides Niimi, IE 97-14 (1997-05)).
[0004]
[Problem(s) to be Solved by the Invention] However, if a picture is recorded with information, such as voice, since data capacity will increase as compared with the case where only a picture is recorded, there is a trouble of it becoming impossible to perform storage and transmission of data efficiently. It aims at offering the record medium which is recording the image-recording equipment which compresses and records a picture with other data of a lot of, the image-recording method, the record medium which is recording the image-recording program and the picture reproducer which the compressed picture is decoded and is reproduced, the image reconstruction method, and the image reconstruction program, it suppressing the increase in data capacity and lessening degradation of a part of picture, in order that this invention may solve the above-mentioned trouble.
[0005]
[Means for Solving the Problem] A field storage means by which the field information which this invention is image recording equipment which embeds and records other information on the image information for one screen, and shows some fields of one screen in order to attain the above-mentioned purpose is memorized, As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the

field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information It has a substitution means replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned.
[0006] Moreover, a field storage means by which the field information which this invention is a picture reproducer which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized, A receiving means to receive the image information for one screen where other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.
[0007]
[Embodiments of the Invention] 1. Explain the digital still camera 1 as one of the gestalten of operation concerning gestalt 1 this invention of operation.
1.1 As shown in drawing 1 and drawing 2 , the composition digital still camera 1 of a digital still camera 1 equips a transverse plane with a loudspeaker 11, a microphone 12, and a lens 18, equips a tooth back with the image display section 13, the reproduction buttons 21a and 21b, and a finder 17, is equipped with the status-display section 15 which displays a shutter release 14, shutter speed, a drawing value, etc. on the upper surface, and is equipped with the memory card insertion mouth 19 with which memory card 20 is inserted in the side.
[0008] As a digital still camera 1 is shown in the block diagram of drawing 3 The image pck-up section 31, the photography image memory 33, the coding section 34, the memory 35 for signs, the memory card I/O section 36, the sound-collecting section 41, the audio coding section 43, the audio memory 44, the decision value storage section 37, the decryption section 62, the audio memory 54, the audio decryption section 53, the voice reproduction section 51, It consists of picture memory 61 for a display, and the image display section 13. the coding section 34 As shown in the block diagram of drawing 4 , it consists of the DCT section 71, the quantization section 72, a data embedding part 73, and the Huffman coding section 74. the decryption section 62 As shown in the block diagram of drawing 5 , it consists of the Huffman decryption section 84, the data extraction section 83, the reverse quantization section 82, and a reverse DCT section 81.
(Image pck-up section 31) When the image pck-up section 31 consists of a lens 18, CCD, etc. and a shutter release 14 is pushed Receive the beam of light by which incidence was carried out from the outside via the lens 18, and it changes into an electrical signal. 640 pixels wide, 480 pixels long, and the digitized luminance signal Y that consists of a total of 307200 pixels 320 pixels wide, 240 pixels long, and the digitized color-difference signals Cr and Cb that consist of a total of 76800 pixels are formed, respectively, and the luminance signal Y and color-difference signals Cr and Cb for one screen which were formed are written in the photography image memory 33. The luminance signal Y101 for one screen digitized by drawing 6 is shown. The luminance signal Y101 for one digitized screen consists of a total of 80 blocks wide, 60 blocks long, and 4800 blocks, and each block consists of 8 pixels wide, length of 8 pixels, and a total of 64 pixels. Block 102 is one block included in the luminance signal Y101 for one screen. The color-difference signals Cr and Cb for one digitized screen consist of a total of 40 blocks wide, 30 blocks long, and 1200 blocks similarly, respectively.
(Photography image memory 33) The photography image memory 33 memorizes temporarily the luminance signal Y101 for one screen by which digitization was carried out [aforementioned], and the color-difference signals Cr and Cb for one screen.
The sound-collecting section 41 A microphone 12, amplifier, an AD translation circuit, (Sound-collecting section 41) For [when it consists of quantization circuits etc. and a shutter release 14 is

pushed] 5 seconds from, Collect external voice and the voice which collected the sound is changed into the electrical signal of an analog. The electrical signal of an analog is sampled by the 44kHz sampling frequency, the electrical signal of each sampled analog is changed into a 8-bit digital signal, and the aforementioned digital signal is outputted to the audio coding section 43.
(Audio coding section 43) Based on the specification of MPEG1 audio coding, the aforementioned digital signal with which voice was changed and generated is changed, and the audio coding section 43 counts bit length m of the audio bit stream 111 which generated and generated the audio bit stream 111, it outputs the generated audio bit stream 111 to the audio memory 44, and outputs bit length m to the data embedding part 73 of the coding section 34. In addition, about the specification of MPEG1 audio coding, since it is well-known, explanation is omitted.
(Audio memory 44) The audio memory 44 memorizes the generated audio bit stream 111 by the audio coding section 43.
(Decision value storage section 37) The decision value storage section 37 has the judgment information table 200 shown in drawing 7 , and the frame information table 250 shown in drawing 8 .
[0009] The judgment information table 200 has memorized two or more groups of the coefficient number of bits 201, the embedded number of bits 202, and a decision value 203. The coefficient number of bits 201 shows the number of bits of a quantization DCT coefficient. the embedded number of bits 202 It is shown other what bit data are embedded from the least significant bit of a quantization DCT coefficient. a decision value 203 It is the threshold used in order to judge whether other data are embedded for a quantization DCT coefficient. When equal, a quantization DCT coefficient is larger than a decision value 203, or embedding of other data is performed, and when a quantization DCT coefficient is smaller than a decision value 203, embedding of other data is not performed.
[0010] The frame information table 250 has memorized at least one group of upper left X coordinate 251, upper left Y coordinate 252, lower right X coordinate 253, and lower right Y coordinate 254. Aforementioned each class shows the position of the rectangle field in 1 screen, and upper left X coordinate 251, upper left Y coordinate 252, lower right X coordinate 253, and lower right Y coordinate 254 show the X coordinate of the upper left point of the aforementioned rectangle field, the Y coordinate of an upper left point, the X coordinate of a lower right point, and the Y coordinate of a lower right point, respectively. The frame information table 250 shown in drawing 8 has memorized the position of four rectangle fields as an example.
[0011] In drawing 9 , the luminance signal 300 for one screen includes the rectangle fields 301, 302, 303, and 304, and the rectangle fields 301, 302, 303, and 304 are equivalent to four rectangle fields memorized by the frame information table 250 shown in drawing 8 , respectively. These four rectangle fields are doubled and it is called a frame field.
The luminance signal Y101 for one digitized screen the DCT section 71 is remembered to be by the photography image memory 33, the color-difference signal Cr for one digitized screen, (DCT section 71) Each block included in Cb is read one by one, for every read block, the discrete cosine transform which is a kind of orthogonal transformation is given, the DCT coefficient block which consists of DCT coefficients of 64 pieces is generated, and the DCT coefficient block which generated is outputted to the quantization section 72.
[0012] Here, a DCT coefficient consists of a direct-current (DC) component and an alternating current (DC) component, the first DCT coefficient of one piece is a dc component among the generated DCT coefficients of 64 pieces, and the remaining DCT coefficients of 63 pieces are alternating current components. If DCT conversion is given to the picture which consists of a block, in the aforementioned alternating current component, image information will mainly concentrate on a low-frequency component. For this reason, in order to encode in high efficiency by the few number of bits, many numbers of bits are used for the DCT coefficient of a low-frequency component.
[0013] In addition, about a discrete cosine transform, since it is well-known, explanation is omitted.
(The quantization section 72) The quantization section 72 is equipped with the quantization table which consists of a total of width 8 element x length 8 element and 64 elements, generates the quantization DCT coefficient block constituted from a quantization DCT coefficient of 64 pieces by the formula 1,

and outputs the quantization DCT coefficient block which generated to a data embedding part 73 using each DCT coefficient which constitutes the DCT coefficient block received from the DCT section 71, and each element of a corresponding quantization table.
(Formula 1)
Quantization DCT coefficient = round (element of a DCT coefficient / quantization table)
Here, round is a function meaning integer-ization to the nearest integer.
[0014] Human being's visual sense is said to have the property of a low pass filter, and is insensible to a high frequency component. Therefore, about a high frequency component, even if it performs a little coarse quantization, the influence is not conspicuous. Therefore, a big value is set to the high frequency component of a quantization table, and a small value is set to it by the low-frequency component. For this reason, the quantization DCT coefficient of a high frequency component can be expressed by the few number of bits, and the quantization DCT coefficient of a low-frequency component is expressed using many numbers of bits.
(Data embedding part 73) The data embedding part 73 has an embedded ending flag. An embedded ending flag is a flag which shows whether the embedding to the quantization DCT coefficient block of the audio bit stream 111 is completed. When an embedded ending flag was OFF, the embedding to the quantization DCT coefficient block of an audio bit stream was not ended, but when an embedded ending flag is ON, the embedding to the quantization DCT coefficient block of an audio bit stream is ended.
[0015] The data embedding part 73 receives a quantization DCT coefficient block from the quantization section 72. Next, since the data embedding part 73 has not ended the embedding to the quantization DCT coefficient block of an audio bit stream when an embedded ending flag judges whether it is set as ON and set as OFF, it performs embedding of the data shown below. Since the embedding to the quantization DCT coefficient block of an audio bit stream is ended when set as ON, embedding of the data shown below is not performed.
[0016] The data embedding part 73 judges whether the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250. When the quantization DCT coefficient block which the data embedding part 73 received judges that it does not exist in the frame field memorized by the frame information table 250, the data embedding part 73 The quantization DCT coefficient of 63 AC (alternating current) components except the quantization DCT coefficient of one DC (direct current) component among the quantization DCT coefficients of 64 pieces of a quantization DCT coefficient block (the quantization DCT coefficient of AC component is hereafter called AC coefficient.) In order of a zigzag scan, it takes out one at a time.
[0017] The data embedding part 73 searches the coefficient number of bits 201 which is in agreement with the number of bits of AC coefficient taken out the account of before from the judgment information table 200, and takes out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement. The absolute value of AC coefficient taken out the account of before is compared with a decision value 203, and it is large, or the direction of the absolute value of AC coefficient makes a part for the number of bits shown by the embedded number of bits 202 from the least significant bit of taken-out AC coefficient the embedded bit embedding other data, in being equal. When the absolute value of AC coefficient is smaller, the embedding of other data does not carry out to taken-out AC coefficient.
[0018] The relation between the number of bits of the quantization DCT coefficient shown in the judgment information table 200 and the embedding position of data is explained using an example shown in drawing 10 . The quantization DCT coefficient which has four kinds of bit length is shown in this drawing. The quantization DCT coefficient 211 consists of a triplet, and the amount of 1 bit becomes the embedded bit 221 from the least significant bit of the quantization DCT coefficient 211. The quantization DCT coefficient 212 consists of 4 bits, and the amount of 1 bit becomes the embedded bit 222 from the least significant bit of the quantization DCT coefficient 212. The amount of 2 bits become the embedded bit 224 from the least significant bit of the quantization DCT coefficient 214 which similarly the amount of 2 bits become the embedded bit 223 from the least significant bit of the quantization DCT coefficient 213 which consists of 5 bits, and consists of 6 bits.

[0019] The data embedding part 73 is transposed to the bit string which took out in order the bit string which has the number of bits shown by the embedded number of bits 202, and took out the aforementioned embedded bit from the audio bit stream 111 memorized by the audio memory 44 the account of before. This replacement is called embedding of a bit string. Next, when the quantization DCT coefficient block which the data embedding part 73 received judges that it exists in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of a quantization DCT coefficient block, the data embedding part 73 is the sequence of a zigzag scan, and takes out every one quantization DCT coefficient of 63 AC components except the quantization DCT coefficient of one DC component.
[0020] The data embedding part 73 is transposed to the bit string which took out in order the bit string which has the number of bits which is in agreement with the number of bits of AC coefficient taken out the account of before, and took out the aforementioned AC coefficient from the audio bit stream 111 memorized by the audio memory 44 the account of before. The relation between the number of bits of AC coefficient and the embedding position of data is explained using an example shown in drawing 11 . The quantization DCT coefficient which has four kinds of bit length is shown in this drawing. The quantization DCT coefficient 216 consists of a triplet, and the taken-out aforementioned bit string is embedded from the audio bit stream 111 in all the bits of the quantization DCT coefficient 216. The quantization DCT coefficient 217 consists of 4 bits, and the aforementioned bit string taken out by all bits is embedded. The same is said of the quantization DCT coefficients 218 and 219.
[0021] The data embedding part 73 outputs the quantization DCT coefficient block containing the quantization DCT coefficient where a part of audio bit stream 111 was embedded to the Huffman coding section 74, after embedding processing of the aforementioned bit string to each AC coefficient is completed. Next, the audio bit stream 111 explains using drawing 12 how it is embedded for the quantization DCT coefficient of the luminance signal Y for one screen. it is shown in this drawing -- as -- the audio bit stream 111 -- bit strings 120, 121, 122, and 123 and ... it constitutes from 124, 125, and ... having -- the quantization DCT coefficient 141 of the luminance signal Y for one screen -- blocks 130, 131, 132, and 133 and ... it consists of 134, 135, and ... the bit strings 120, 121, 122, and 123 contained in the audio bit stream 111, ..., 124 and 125, and ... respectively -- the blocks 130, 131, 132, and 133 of the quantization DCT coefficient 141 of the luminance signal Y for one screen, and ... it is embedded at 134, 135, and ...
[0022] Next, the bit string 123 contained in the audio bit stream 111 explains using drawing 13 how it is embedded at the block 133 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen. Here, block 133 is a block included to a frame field. The bit string 123 contained in the audio bit stream 111 consists of bit strings 123a, 123b, 123c, 123d, ..., 123e, and the block 133 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen consists of quantization DCT coefficient As C1, AC2, AC3, AC4, ..., AC63 of quantization DCT coefficient-D [of DC component] C, and AC component. Bit strings 123a, 123b, 123c, 123d, ..., 123e are embedded at the quantization DCT coefficient As C1, AC2, AC3, AC4, ..., AC63 of AC component, respectively.
[0023] Next, the bit string 124 contained in the audio bit stream 111 explains using drawing 14 how it is embedded at the block 134 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen. Here, block 134 is a block which is not included to a frame field. The bit string 124 contained in the audio bit stream 111 consists of bit strings 124a, 124b, 124c, 124d, 124e, 124f, and 124g, and the block 134 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen consists of quantization DCT coefficient-D [of DC component] C, quantization DCT coefficient As C1, AC2, AC3, AC4, AC5, AC6, and AC7 of AC component, and ... Bit strings 124a, 124b, 124c, 124d, 124e, 124f, and 124g are embedded at the lower bit of the quantization DCT coefficient As C1, AC2, AC3, AC4, AC5, AC6, and AC7 of AC component, respectively.
[0024] In addition, the reason the data embedding part 73 performs embedding except for the quantization DCT coefficient of one DC (direct current) component among the quantization DCT coefficients of 64 pieces is as follows. difference with the quantization DCT coefficient of DC component by which the quantization DCT coefficient of DC component contained in one quantization

DCT coefficient block is contained in the block before one -- it is expressed by the value Therefore, it is because it is thought that the picture which decoded and generated the compression picture encoded by the error by the bit string embedded supposing it performed embedding also for the quantization DCT coefficient of DC component of each block accumulating, influencing [which cannot be disregarded] the quantization DCT coefficient of next DC component temporarily, and doing in this way has high possibility that change clearly with human being's visual senses, and it is visible.
(Huffman coding section 74) Using the quantization DCT coefficient block received from the data embedding part 73, Huffman coding of the Huffman coding section 74 is carried out, and it generates the compression sign train which is a part of compression picture, and writes the generated compression sign train in the memory 35 for signs.
(Memory 35 for signs) The memory 35 for signs memorizes temporarily the compression picture encoded by the coding section 34.
(Memory card I/O section 36) When the compression picture memorized by the memory 35 for signs is written in memory card 20 and the reproduction buttons 21a and 21b are operated by the user, the memory card I/O section 36 reads the compression picture memorized by memory card 20, and writes the read compression picture in the memory 35 for signs.
(Huffman decryption section 84) The Huffman decryption section 84 detects the head code of a block from the compression picture memorized by the memory 35 for signs, Huffman decode of the compression picture is carried out for every block, two or more quantization DCT coefficient blocks which consist of a quantization DCT coefficient of 64 pieces are repeated, it generates and the quantization DCT coefficient block which generated is outputted to the data extraction section 83 and the reverse quantization section 82.
(Data extraction section 83) The data extraction section 83 receives a quantization DCT coefficient block from the Huffman decryption section 84.
[0025] The data extraction section 83 judges whether the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250. When judging that the received quantization DCT coefficient block does not exist in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of the quantization DCT coefficient block received the account of before, the data extraction section 83 is the sequence of a zigzag scan, and takes out every one AC coefficient of 63 pieces except DC coefficient of one piece. As it is shown below from one taken-out AC coefficient, a part of audio bit stream which took out and took out a part of audio bit stream is written in the audio memory 54. The data extraction section 83 repeats the aforementioned writing to the audio memory 54 at the time of the ability to perform a part of ejection of the aforementioned audio bit stream, and ejection of a part of audio bit stream about AC coefficient of 63 pieces.
[0026] Next, extraction of a part of audio bit stream in the case of judging that it does not exist in the aforementioned frame field is explained. The data extraction section 83 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC coefficient from the judgment information table 200, and takes out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement. The absolute value of AC coefficient taken out the account of before is compared with a decision value 203, and it is large, or the direction of the absolute value of AC coefficient takes out the bit string for the number of bits shown by the embedded number of bits 202 as a part of audio bit stream from the least significant bit of taken-out AC coefficient, in being equal. Since the audio bit stream is not embedded when the absolute value of AC coefficient is smaller, ejection of a bit string is not performed.
[0027] When judging that the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of the quantization DCT coefficient block received the account of before, the data extraction section 83 is the sequence of a zigzag scan, and takes out every one AC coefficient of 63 pieces except DC coefficient of one piece. One taken-out AC coefficient is made into a part of audio bit stream, and it writes in the audio memory 54. The data extraction section 83 repeats the aforementioned writing to the

audio memory 54 at the time of the ability to perform a part of ejection of the aforementioned audio bit stream, and ejection of a part of audio bit stream about AC coefficient of 63 pieces.
Each quantization DCT coefficient which constitutes the quantization DCT coefficient block which the reverse quantization section 82 was equipped with the quantization table which consists of a total of width 8 element x length 8 element and 64 elements, and was received from the Huffman decryption section 84, (Reverse quantization section 82) Using each element of a corresponding quantization table, the DCT coefficient block constituted from a DCT coefficient of 64 pieces by the formula 2 is generated, and the DCT coefficient block which generated is outputted to the reverse DCT section 81.
(Formula 2)
DCT coefficient = the element (reverse DCT section 81) reverse DCT section 81 of a quantization DCT coefficient x quantization table gives a reverse discrete cosine transform using the DCT coefficient which constitutes the DCT coefficient block which received the DCT coefficient block and received from the reverse quantization section 82, and writes some static images which generated and generated some static images in the picture memory 61 for a display.
(Audio memory 54) The audio memory 54 memorizes temporarily the audio bit stream in which decode was carried out by the decryption section 62.
(Audio decryption section 53) The audio decryption section 53 decodes the audio bit stream memorized by the audio memory 54 based on the specification of MPEG1 audio coding, and outputs the voice digital signal which generated and generated the voice digital signal to the voice reproduction section 51.
(Voice reproduction section 51) The voice reproduction section 51 consists of a DA translation circuit, a loudspeaker 11, etc., changes into a voice analog signal the voice digital signal which received and received the voice digital signal from the audio decryption section 53, changes the aforementioned voice analog signal into voice, and is reproduced.
(Picture memory 61 for a display) The picture memory 61 for a display memorizes temporarily the still picture in which decode was carried out by the decryption section 62.
(Image display section 13) The image display section 13 consists of liquid crystal displays etc., and displays the still picture memorized by the picture memory 61 for a display.
1.2 Explain operation of the digital still camera 1 of a digital still camera 1 of operation.
(Operation at the time of photography of a digital still camera 1) Operation at the time of photography of a digital still camera 1 is explained using the flow chart shown in drawing 15 .
[0028] The sound-collecting section 41 collects external voice for 5 seconds from, when a shutter release 14 is pushed (Step S101), it changes into the electrical signal of an analog the voice which collected the sound, samples the electrical signal of an analog by the 44kHz sampling frequency, changes the electrical signal of each sampled analog into a 8-bit digital signal, and outputs it to the audio coding section 43 (Step S102). Based on the specification of MPEG1 audio coding, compression coding of the aforementioned digital signal with which voice was changed and generated is carried out, and the audio coding section 43 counts bit length m of the audio bit stream 111 which generated and generated the audio bit stream 111, it outputs the generated audio bit stream 111 to the audio memory 44, and outputs bit length m to the data embedding part 73 of the coding section 34 (Step S103).
[0029] On the other hand, the image pck-up section 31 picturizes the exterior as a still picture, when a shutter release 14 is pushed (Step S104). The digitized luminance signal Y which consists the picturized still picture of 640 pixels wide, 480 pixels long, and a total of 307200 pixels It changes into 320 pixels wide, 240 pixels long, and the digitized color-difference signals Cr and Cb that consist of a total of 76800 pixels, respectively, and the luminance signal Y and color-difference signals Cr and Cb for one screen which were digitized are written in the photography image memory 33 (Step S105).
[0030] The coding section 34 performs coding processing, and writes the compression picture which generated and generated the compression picture in the memory 35 for signs (Step S106), and the memory card I/O section 36 writes the compression picture memorized by the memory 35 for signs in memory card 20 (Step S107).
(Operation of the coding section 34) Operation of the coding section 34 is explained using the flow chart

shown in drawing 16 .
[0031] As initial value, the value of 0 is set as Variable j (Step S111), the value of 0 is set as Variable k (Step S112), and an embedded ending flag is set to OFF (Step S113). Here, Variable j shows the bit position in audio bit SURITOMU, and Variable k shows the block number in the luminance signal for one screen. A block number shall be counted from the left in order from the right and a top to the bottom in 1 screen.
[0032] The DCT section 71 reads the k-th block in the luminance signal Y101 for one digitized screen which is memorized by the photography image memory 33, generates the DCT coefficient block which read and which gives a discrete cosine transform and consists of DCT coefficients of 64 pieces for every block, and outputs the DCT coefficient block which generated to the quantization section 72 (Step S114).
[0033] Using each DCT coefficient which constitutes the DCT coefficient block received from the DCT section 71, and each element of a corresponding quantization table, the quantization section 72 generates the quantization DCT coefficient block constituted from a quantization DCT coefficient of 64 pieces by the formula 1, and outputs the quantization DCT coefficient block which generated to the data embedding part 73 (Step S115).
[0034] The data embedding part 73 embeds a part of audio bit stream as pad processing outside a frame field at a quantization DCT coefficient block, when it judges whether (Step S116) and the k-th block exist in a frame field when an embedded ending flag is OFF and does not exist in a frame field (Step S120) (Step S117). When it exists in a frame field (Step S120), a part of audio bit stream is embedded as pad processing in a frame field at a quantization DCT coefficient block (Step S121).
[0035] Huffman coding of the Huffman coding section 74 is carried out using the quantization DCT coefficient block received from the data embedding part 73, the compression sign train which is a part of compression picture is generated, and the generated compression sign train is written in the memory 35 for signs (Step S118). It judges by Variable k whether read-out of a block ended the DCT section 71. When larger than all the block counts 4800 contained in the luminance signal Y101 for one screen by which Variable k was digitized, (Step S119), Until it is small, or it ends processing, it returns to (Step S119) and Step S114 when equal, and processing of all blocks is completed Generation of a DCT coefficient block, generation of a quantization DCT coefficient block, **** of an audio bit stream, and Huffman coding are repeated.
[0036] The coding section 34 operates similarly about the luminance signal Y and color-difference signals Cr and Cb for one screen.
(Operation of the data embedding part 73) Operation of the data embedding part 73 is explained using the flow chart shown in drawing 17 and drawing 18 .
[0037] As pad processing outside a frame field, as shown in drawing 17 , the data embedding part 73 sets Variable i as the value of 1 (Step S131). Here, Variable i shows the number of AC coefficient and shows i-th AC coefficient by AC(i). The data embedding part 73 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC(i) from the judgment information table 200. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was a triplet, or when it was 4 bits (Step S132)), Compare a decision value 203 and the absolute value of AC(i) is larger, or in being equal, (Step S151), The value of 1 is added to Variable j (Step S152), and when larger than all bit length m of an audio bit stream (Step S153), Variable j sets ON to an embedding ending flag (Step S155), and ends processing.
[0038] Whether Variable j is smaller than all bit length m of an audio bit stream When equal (Step S153), The bit AB of an audio bit stream (j) is set to 1 bit of the least significant of taken-out AC(i) (Step S154). The value of 1 is added to Variable i (Step S134), Variable i ends processing, when larger than 63 (Step S135), and Variable i returns to Step S132, when [smaller than 63 or] equal (Step S135).
[0039] Here, AB (j) shows the bit of the bit position shown by Variable j within an audio bit stream. The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC(i) is smaller, control is moved to (Step S151) and Step S134.

[0040] The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was 5 bits, or when it was 6 bits (Step S133)), Compare a decision value 203 and the absolute value of AC(i) is larger, or in being equal, (Step S141), The value of 1 is added to Variable j (Step S142), and when larger than all bit length m of an audio bit stream (Step S143), Variable j advances control to Step 155, sets ON to an embedding ending flag (Step S155), and ends processing.
[0041] Whether Variable j is smaller than all bit length m of an audio bit stream When equal (Step S143), The bit AB of an audio bit stream (j) is set to the 2nd bit from the least significant of taken-out AC(i) (Step S144). The value of 1 is added to Variable j (Step S145). Variable j When larger than all bit length m of an audio bit stream (Step S146), The bit AB of an audio bit stream (j) is set to the least significant bit of taken-out AC(i) (Step S147), control is advanced to Step S155, ON is set to an embedding ending flag (Step S155), and processing is ended.
[0042] The bit AB of an audio bit stream (j) is set to the least significant bit of whether Variable j is smaller than all bit length m of an audio bit stream, and AC(i) taken out when equal (Step S146) (Step S148), and control is returned to Step S134. The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC(i) is smaller, control is returned to (Step S141) and Step S134.
[0043] In addition, with the form of this operation, there cannot be no AC coefficient, when AC(i) is not not a triplet but 4 bits (Step S132) and AC(i) is not not 5 bits but 6 bits (Step S133), since either a triplet, 4 bits, 5 bits or 6 bits are taken. As pad processing in a frame field, as shown in drawing 18 , the data embedding part 73 sets Variable i as the value of 1 (Step S171).
[0044] It begins from the bit AB of an audio bit stream (j), the bit string for the number of bits of AC(i) is written in AC(i) (Step S172), and the number of bits of AC(i) is added to Variable j (Step S173). When larger than all bit length m of an audio bit stream (Step S174), Variable j sets ON to an embedding ending flag (Step S177), and ends processing.
[0045] When equal (Step S174), Variable j is smaller than all bit length m of an audio bit stream, or the value of 1 is added to Variable i (Step S175), Variable i ends processing, when larger than 63 (Step S176), and Variable i returns to Step S172, when [smaller than 63 or] equal (Step S176).
(Operation at the time of reproduction of a digital still camera 1) Operation at the time of reproduction of a digital still camera 1 is explained using the flow chart shown in drawing 19 .
[0046] The memory card I/O section 36 reads the compression picture memorized by memory card 20 to the memory 35 for signs, when the reproduction buttons 21a and 21b are operated by the user (Step S201). The decryption section 62 decodes the compression picture memorized by the memory 35 for signs, generates a still picture and an audio bit stream, writes a still picture in the picture memory 61 for a display, and writes an audio bit stream in the audio memory 54 (Step S202).
[0047] The image display section 13 displays the still picture memorized by the picture memory 61 for a display (Step S203). On the other hand, the audio decryption section 53 decodes the audio bit stream memorized by the audio memory 54 based on the specification of MPEG1 audio coding (Step S204). A voice digital signal is generated and the generated voice digital signal is outputted to the voice reproduction section 51 (Step S205). the voice reproduction section 51 The voice digital signal which received the voice digital signal and was received from the audio decryption section 53 is changed into a voice analog signal, the aforementioned voice analog signal is changed into voice, and it reproduces (Step S206).
(Operation of the decryption section 62) Operation of the decryption section 62 is explained using the flow chart shown in drawing 20 .
[0048] The Huffman decryption section 84 detects the head code of a block from the compression picture memorized by the memory 35 for signs (Step S212), carries out Huffman decode of the compression picture for every block, generates the quantization DCT coefficient block which consists of a quantization DCT coefficient of 64 pieces, and outputs the quantization DCT coefficient block which generated to the data extraction section 83 and the reverse quantization section 82 (Step S213).
[0049] When a quantization DCT coefficient block is received from the Huffman decryption section 84

and a quantization DCT coefficient block does not exist in a frame field (Step S218), as processing outside a frame field, from the quantization DCT coefficient block received the account of before, the data extraction section 83 takes out a part of audio bit stream, and writes a part of taken-out audio bit stream in the audio memory 54 (Step S214). When a quantization DCT coefficient block exists in a frame field (Step S218), as processing in a frame field, from the quantization DCT coefficient block received the account of before, a part of audio bit stream is taken out, and a part of taken-out audio bit stream is written in the audio memory 54 (Step S219).

[0050] Using each quantization DCT coefficient which constitutes the quantization DCT coefficient block received from the Huffman decryption section 84, and each element of a corresponding quantization table, the reverse quantization section 82 generates the DCT coefficient block constituted from a DCT coefficient of 64 pieces by the formula 2, and outputs the DCT coefficient block which generated to the reverse DCT section 81 (Step S215).

[0051] The reverse DCT section 81 gives a reverse discrete cosine transform using the DCT coefficient which constitutes the DCT coefficient block which received the DCT coefficient block and received from the reverse quantization section 82, and writes some static images which generated and generated some static images in the picture memory 61 for a display (Step S216). ** [the Huffman decryption section's 84 detection of the end of read-out of the compression picture memorized by the memory 35 for signs / end / processing / section / (Step S217)] If read-out of the compression picture of the Huffman decryption section 84 is not completed (Step S217), it will return to Step S212 and detection of the head code of a block, generation of a quantization DCT coefficient block, extraction of a part of audio bit stream, generation of a DCT coefficient block, and generation of a picture block will be repeated.

(Operation of the data extraction section 83) Operation of the data extraction section 83 is explained using drawing 21 and the flow chart shown in 22.

[0052] In outside a frame field, as shown in drawing 21 , the data extraction section 83 sets Variable i as the value of 1 (Step S231). Here, Variable i shows the number of AC coefficient and shows i-th AC coefficient by AC(i). The data extraction section 83 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC(i) from the judgment information table 200. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was a triplet, or when it was 4 bits (Step S232)), Compare a decision value 203 and the absolute value of AC coefficient is larger, or in being equal, (Step S250), The least significant bit of taken-out AC(i) is set to the audio bit stream AB (j) (Step S251). Add the value of 1 to Variable j (Step S252), and the value of 1 is added to Variable i (Step S234). Variable i ends processing, when larger than 63 (Step S235), and when [smaller than 63 or] equal (Step S235), Variable i returns to Step S232, and repeats extraction of an audio bit stream.

[0053] The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC coefficient is smaller, control is moved to (Step S250) and Step S234. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was 5 bits, or when it was 6 bits (Step S233)), Compare a decision value 203 and the absolute value of AC coefficient is larger, or in being equal, (Step S240), The 2nd bit is set to the audio bit stream AB (j) from the least significant of taken-out AC(i) (Step S241). The value of 1 is added to Variable j (Step S242), the least significant bit of taken-out AC(i) is set to the audio bit stream AB (j) (Step S243), the value of 1 is added to Variable j (Step S244), and control is moved to Step S234.

[0054] The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC coefficient is smaller, control is moved to (Step S240) and Step S234. In addition, with the gestalt of this operation, there cannot be no AC coefficient, when AC(i) is not not a triplet but 4 bits (Step S232) and AC(i) is not not 5 bits but 6 bits (Step S233), since either a triplet, 4 bits, 5 bits or 6 bits are taken.

[0055] In in a frame field, as shown in drawing 22 , the data extraction section 83 sets Variable i as the

value of 1 (Step S271). The data extraction section 83 begins from the bit AB of the audio bit stream 111 (j), writes AC(i) in the bit string for the number of bits of AC(i) (Step S272), and adds the number of bits of AC(i) to Variable j (Step S273). The value of 1 is added to Variable i (Step S274), Variable i ends processing, when larger than 63 (Step S275), and Variable i returns to Step S271, when [smaller than 63 or] equal (Step S275).
1.3 The method shown in the gestalt 1 of the above-mentioned operation was actually applied to the example of application level 640-pixel x perpendicular of 480 pixels, and the full color picture of 8 bits each of RGB.
[0056] In the case of 4 bits or more, in the case of the triplet, the quantization DCT coefficient of a luminance signal and a color-difference signal embedded another data which used the random number for 1 bit of low ranks, and were generated at 2 bits of low ranks of a quantization DCT coefficient. The capacity of the compression picture after embedding 20.5 K bytes of capacity of another data which embedded 75 K bytes of capacity of the compression picture when not embedding another data is 75 K bytes. Therefore, about 27.3% of data were able to be embedded to the capacity of the compression picture after embedding.
1.4 As explained more than the conclusion, it has the embedding field of data as a frame field of the picture circumference, write the watermark information on a constant rate in fields other than a frame field per unit area, and write many quantity of watermark information in a frame field from fields other than the aforementioned frame field per unit area. Moreover, these watermark information is read.
[0057] Thereby, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.
1.5 Don't restrict the method of spacing other data through other modification (1) image information, and writing in it as information to the method of embedding shown in the gestalt of the above-mentioned operation. You may be other methods.
(2) Write watermark information in fields other than a frame field, and [the gestalt of the above-mentioned operation] though other information is not embedded in any fields other than a frame field, it is good for them.
(3) Although [the gestalt of the above-mentioned operation] speech information is written in a still picture, it is good though speech information is written in an animation.
(4) The example of the pattern of other frame fields is shown in drawing 23 . In drawing 23 (a), the frame field was established in four corners of a picture, respectively. The circumference of the elliptical portion of the center of a picture was made into the frame field in drawing 23 (b). In drawing 23 (c), the circumference of the heart configuration portion of the center of a picture was made into the frame field. Since it can divide into two or more small rectangle fields, respectively, these frame fields can be expressed as a frame information table 250.
The frame information table 250 is memorized with the frame number which discriminates each frame field for the information which shows two or more frame fields. (5) The data embedding part 73 A frame number is embedded for the quantization DCT coefficient of the first AC component of the quantization DCT coefficient for one screen. the data extraction section 83 It is good, though a frame number is extracted from the quantization DCT coefficient of the first AC component of the quantization DCT coefficient for one screen and one frame field is discriminated from two or more frame fields.
(6) Though the frame information table 250 has memorized the information which shows fields other than a frame field, it is good. In this case, the data embedding part 73 judges whether the received quantization DCT coefficient block exists in fields other than a frame field.
(7) You may set up a frame field which is different the case of a luminance signal, and in the case of a color-difference signal.

(8) The another compression method is sufficient as the audio compression method.
(9) In the gestalt 1 of operation, and the gestalt 2 of operation, although voice is added to a still picture, you may not be voice. You may be the information and music information which show other pictures and an author instead of voice, and text information.
(10) Though one of the another gestalten of operation is the image recording method and the image reconstruction method which are shown by the above, it is good. Moreover, it is good also as a record medium including the program which makes a computer perform the aforementioned method in which computer reading is possible. Furthermore, it is good though the aforementioned program is transmitted through a communication line. Moreover, it is good also as a record medium which is recording the compression picture by which generation was carried out [aforementioned] and in which computer reading is possible.
(11) It is good though the gestalt 1 and the above-mentioned modification of operation are combined, respectively.
[0058]
[Effect of the Invention] A field storage means by which the field information which this invention is image recording equipment which embeds and records other information on the image information for one screen, and shows some fields of one screen as explained above is memorized, As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information It has a substitution means replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned.
[0059] According to this composition, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.
[0060] Moreover, a field storage means by which the field information which this invention is a picture reproducer which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized, A receiving means to receive the image information for one screen where other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.
[0061] According to this composition, it is effective in the ability to read the information written in a frame field and other fields, and reproduce. Moreover, this invention embeds and records other information on the image information for one screen. A field storage means by which the field information which is the image recording regenerative apparatus which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized, As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information The bit string of the aforementioned

predetermined length and different length is read from information besides the above. A storage means to memorize the image information for one screen containing the image information with which the substitution means replaced with the aforementioned bit string which read the low order digit of the image information concerned, and the aforementioned bit string were replaced, The picture read-out means which reads the image information for one screen where other information was embedded from the aforementioned storage means, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.

[0062] According to this composition, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them. Moreover, it is effective in the ability to read the information written in a frame field and other fields, and reproduce.

[0063] As explained above, this invention is the image recording method used with the image recording equipment which is equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen. As opposed to the image information contained to the field indicated to be the receiving step which receives the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information The substitution step replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned is included.

[0064] If this method is used, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

[0065] Moreover, this invention reproduces a picture from the image information for one screen where was equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and other information was embedded. The receiving step which receives the image information for one screen where it is the image reconstruction method used by the picture reproducer which reads other information, and other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out step which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, The reproduction step which reproduces the image information for one screen where information besides the above was embedded is included.

[0066] When this method is used, it is effective in the ability to read the information written in a frame field and other fields, and reproduce. Moreover, this invention is a record medium which is recording the image recording program used by computer which is equipped with a field storage means by which

the field information which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen. The receiving step from which the aforementioned program receives the image information for one screen, and other information, As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information to the image information contained to the field shown using the aforementioned field information The substitution step replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned is included.

[0067] By executing this program by computer, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

[0068] Moreover, this invention reproduces a picture from the image information for one screen where was equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and other information was embedded. It is the record medium which is recording the image reconstruction program used by computer which reads other information. the aforementioned program The receiving step which receives the image information for one screen where other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out step which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, The reproduction step which reproduces the image information for one screen where information besides the above was embedded is included.

[0069] By executing this program by computer, it is effective in the ability to read the information written in a frame field and other fields, and reproduce.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL FIELD

[The technical field to which invention belongs] this invention relates to the picture coding technology and picture decryption technology of using the digital-watermarking technology of making a picture hiding another information in its hand in the invisible state.

[Translation done.]

* NOTICES *

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PRIOR ART

[Description of the Prior Art] In recent years, the mass production technology of a computer is remarkable and the commercial scene is provided with the so-called highly efficient personal computer so much by the low price. Conjointly, many people use a personal computer for it, create original digital contents to it himself, and are performing information dispatch of these contents to it through the Internet. Usually, if it is called the digital contents which carry out information dispatch, there are many JPEG pictures picturized with the digital camera etc. not to mention a text. This is because information is enough told by high visual-recognition nature peculiar to human being with a still picture. Moreover, if a JPEG picture is used, a still picture is compressed, the data capacity of a still picture decreases, and management and transmission of data can be performed efficiently.
[0003] Recently, the demand that he wants to make information offer also using the acoustic sense has also increased by adding sound information to a still picture. In such a case, FlashPix etc. is used as a digital file format which added sound information to the still picture. Moreover, the method which embeds another information so much in the picture which is an incompressible file is proposed by "the picture depths enciphering method for having used the field division by complexity" (an electronic-intelligence communication society technical report besides Niimi, IE 97-14 (1997-05)).

[Translation done.]

* NOTICES *

EFFECT OF THE INVENTION

[Effect of the Invention] It is a field storage means by which the field information which this invention is image recording equipment which embeds and records other information on the image information for one screen as explained above, and shows some fields of one screen is memorized. As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information It has a substitution means replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned.

[0059] According to this composition, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

[0060] Moreover, this invention is a field storage means by which the field information which is the picture reproducer which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized. A receiving means to receive the image information for one screen where other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.

[0061] According to this composition, it is effective in the ability to read the information written in a frame field and other fields, and reproduce. Moreover, this invention embeds and records other information on the image information for one screen. A field storage means by which the field information which is the image recording regenerative apparatus which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized, As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information The bit string of the aforementioned predetermined length and different length is read from information besides the above. A storage means

to memorize the image information for one screen containing the image information with which the substitution means replaced with the aforementioned bit string which read the low order digit of the image information concerned, and the aforementioned bit string were replaced, The picture read-out means which reads the image information for one screen where other information was embedded from the aforementioned storage means, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.

[0062] According to this composition, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them. Moreover, it is effective in the ability to read the information written in a frame field and other fields, and reproduce.

[0063] It is [the receiving step which this invention is the image recording method used with the image recording equipment which is equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen as explained above, and receives the image information for one screen, and other information, and] the aforementioned field information. The substitution step replaced with the aforementioned bit string which read the bit string of predetermined length from information besides the above, read the bit string of the aforementioned predetermined length and different length from information besides the above to the image information contained to the field shown to the image information which is not contained to the field shown using the aforementioned field information, and read the low order digit of the image information concerned is included.

[0064] If this method is used, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

[0065] Moreover, this invention is [the receiving step which receives the image information for one screen where it is the image reconstruction method used by the picture reproducer which reproduces a picture from the image information for one screen where was equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and other information was embedded, and reads other information, and other information was embedded, and] the aforementioned field information. The bit string of predetermined length is read from the low order digit of the image information contained to the field shown as other information, and the read-out step which reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, and the reproduction step which reproduces the image information for one screen where information besides the above was embedded are included.

[0066] When this method is used, it is effective in the ability to read the information written in a frame field and other fields, and reproduce. Moreover, this invention is [the receiving step from which it is the record medium which is recording the image recording program used by computer which is equipped with a field storage means by which the field information which shows some fields of one screen is memorized, and embeds and records other information on the image information for one screen and the

aforementioned program receives the image information for one screen, and other information, and] the aforementioned field information. The substitution step replaced with the aforementioned bit string which read the bit string of predetermined length from information besides the above, read the bit string of the aforementioned predetermined length and different length from information besides the above to the image information contained to the field shown to the image information which is not contained to the field shown using the aforementioned field information, and read the low order digit of the image information concerned is included.

[0067] By executing this program by computer, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

[0068] Moreover, this invention is [the receiving step which is the record medium which is recording the image reconstruction program used by the computer which reproduces a picture from the image information for one screen where was equipped with a field storage means to by_which the field information which shows some fields of one screen has been memorized, and other information was embedded, and reads other information, and receives the image information for one screen where the information on others / program / aforementioned] was embedded, and / the aforementioned field information. The bit string of predetermined length is read from the low order digit of the image information contained to the field shown as other information, and the read-out step which reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, and the reproduction step which reproduces the image information for one screen where information besides the above was embedded are included.

[0069] By executing this program by computer, it is effective in the ability to read the information written in a frame field and other fields, and reproduce.

[Translation done.]

* NOTICES *

1. This document has been translated by computer.So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3.In the drawings, any words are not translated.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, if a picture is recorded with information, such as voice, since data capacity will increase as compared with the case where only a picture is recorded, there is a trouble of it becoming impossible to perform storage and transmission of data efficiently. It aims at offering the record medium which is recording the image-recording equipment which compresses and records a picture with other data of a lot of, the image-recording method, the record medium which is recording the image-recording program and the picture reproducer which the compressed picture is decoded and is reproduced, the image reconstruction method, and the image reconstruction program, it suppressing the increase in data capacity and lessening degradation of a part of picture, in order that this invention may solve the above-mentioned trouble.
[0005]

[Translation done.]

* NOTICES *

MEANS

[Means for Solving the Problem] A field storage means by which the field information which this invention is image recording equipment which embeds and records other information on the image information for one screen, and shows some fields of one screen in order to attain the above-mentioned purpose is memorized, As opposed to the image information contained to the field indicated to be a receiving means to receive the image information for one screen, and other information using the aforementioned field information As opposed to the image information which is not contained to the field which reads the bit string of predetermined length from information besides the above, and is shown using the aforementioned field information It has a substitution means replaced with the aforementioned bit string which read the bit string of the aforementioned predetermined length and different length from information besides the above, and read the low order digit of the image information concerned.
[0006] Moreover, a field storage means by which the field information which this invention is a picture reproducer which reproduces a picture from the image information for one screen where other information was embedded, and reads other information, and shows some fields of one screen is memorized, A receiving means to receive the image information for one screen where other information was embedded, From the low order digit of the image information contained to the field shown using the aforementioned field information The read-out means which reads the bit string of predetermined length as other information, and reads the bit string of the aforementioned predetermined length and different length from the low order digit of the image information which is not contained to the field shown using the aforementioned field information as other information, It has a reproduction means to reproduce the image information for one screen where information besides the above was embedded.
[0007]
[Embodiments of the Invention] 1. Explain the digital still camera 1 as one of the gestalten of operation concerning gestalt 1 this invention of operation.
1.1 As shown in drawing 1 and drawing 2 , the composition digital still camera 1 of a digital still camera 1 equips a transverse plane with a loudspeaker 11, a microphone 12, and a lens 18, equips a tooth back with the image display section 13, the reproduction buttons 21a and 21b, and a finder 17, is equipped with the status-display section 15 which displays a shutter release 14, shutter speed, a drawing value, etc. on the upper surface, and is equipped with the memory card insertion mouth 19 with which memory card 20 is inserted in the side.
[0008] As a digital still camera 1 is shown in the block diagram of drawing 3 The image pck-up section 31, the photography image memory 33, the coding section 34, the memory 35 for signs, the memory card I/O section 36, the sound-collecting section 41, the audio coding section 43, the audio memory 44, the decision value storage section 37, the decryption section 62, the audio memory 54, the audio decryption section 53, the voice reproduction section 51, It consists of picture memory 61 for a display, and the image display section 13. the coding section 34 As shown in the block diagram of drawing 4 , it consists of the DCT section 71, the quantization section 72, a data embedding part 73, and the Huffman coding section 74. the decryption section 62 As shown in the block diagram of drawing 5 , it consists of

the Huffman decryption section 84, the data extraction section 83, the reverse quantization section 82, and a reverse DCT section 81.
(Image pck-up section 31) When the image pck-up section 31 consists of a lens 18, CCD, etc. and a shutter release 14 is pushed Receive the beam of light by which incidence was carried out from the outside via the lens 18, and it changes into an electrical signal. 640 pixels wide, 480 pixels long, and the digitized luminance signal Y that consists of a total of 307200 pixels 320 pixels wide, 240 pixels long, and the digitized color-difference signals Cr and Cb that consist of a total of 76800 pixels are formed, respectively, and the luminance signal Y and color-difference signals Cr and Cb for one screen which were formed are written in the photography image memory 33. The luminance signal Y101 for one screen digitized by drawing 6 is shown. The luminance signal Y101 for one digitized screen consists of a total of 80 blocks wide, 60 blocks long, and 4800 blocks, and each block consists of 8 pixels wide, length of 8 pixels, and a total of 64 pixels. Block 102 is one block included in the luminance signal Y101 for one screen. The color-difference signals Cr and Cb for one digitized screen consist of a total of 40 blocks wide, 30 blocks long, and 1200 blocks similarly, respectively.
(Photography image memory 33) The photography image memory 33 memorizes temporarily the luminance signal Y101 for one screen by which digitization was carried out [aforementioned], and the color-difference signals Cr and Cb for one screen.
The sound-collecting section 41 A microphone 12, amplifier, an AD translation circuit, (Sound-collecting section 41) For [when it consists of quantization circuits etc. and a shutter release 14 is pushed] 5 seconds from, Collect external voice and the voice which collected the sound is changed into the electrical signal of an analog. The electrical signal of an analog is sampled by the 44kHz sampling frequency, the electrical signal of each sampled analog is changed into a 8-bit digital signal, and the aforementioned digital signal is outputted to the audio coding section 43.
(Audio coding section 43) Based on the specification of MPEG1 audio coding, the aforementioned digital signal with which voice was changed and generated is changed, and the audio coding section 43 counts bit length m of the audio bit stream 111 which generated and generated the audio bit stream 111, it outputs the generated audio bit stream 111 to the audio memory 44, and outputs bit length m to the data embedding part 73 of the coding section 34. In addition, about the specification of MPEG1 audio coding, since it is well-known, explanation is omitted.
(Audio memory 44) The audio memory 44 memorizes the generated audio bit stream 111 by the audio coding section 43.
(Decision value storage section 37) The decision value storage section 37 has the judgment information table 200 shown in drawing 7 , and the frame information table 250 shown in drawing 8 .
[0009] The judgment information table 200 has memorized two or more groups of the coefficient number of bits 201, the embedded number of bits 202, and a decision value 203. The coefficient number of bits 201 shows the number of bits of a quantization DCT coefficient. the embedded number of bits 202 It is shown other what bit data are embedded from the least significant bit of a quantization DCT coefficient. a decision value 203 It is the threshold used in order to judge whether other data are embedded for a quantization DCT coefficient. When equal, a quantization DCT coefficient is larger than a decision value 203, or embedding of other data is performed, and when a quantization DCT coefficient is smaller than a decision value 203, embedding of other data is not performed.
[0010] The frame information table 250 has memorized at least one group of upper left X coordinate 251, upper left Y coordinate 252, lower right X coordinate 253, and lower right Y coordinate 254. Aforementioned each class shows the position of the rectangle field in 1 screen, and upper left X coordinate 251, upper left Y coordinate 252, lower right X coordinate 253, and lower right Y coordinate 254 show the X coordinate of the upper left point of the aforementioned rectangle field, the Y coordinate of an upper left point, the X coordinate of a lower right point, and the Y coordinate of a lower right point, respectively. The frame information table 250 shown in drawing 8 has memorized the position of four rectangle fields as an example.
[0011] In drawing 9 , the luminance signal 300 for one screen includes the rectangle fields 301, 302, 303, and 304, and the rectangle fields 301, 302, 303, and 304 are equivalent to four rectangle fields

memorized by the frame information table 250 shown in drawing 8 , respectively. These four rectangle fields are doubled and it is called a frame field.
The luminance signal Y101 for one digitized screen the DCT section 71 is remembered to be by the photography image memory 33, the color-difference signal Cr for one digitized screen, (DCT section 71) Each block included in Cb is read one by one, for every read block, the discrete cosine transform which is a kind of orthogonal transformation is given, the DCT coefficient block which consists of DCT coefficients of 64 pieces is generated, and the DCT coefficient block which generated is outputted to the quantization section 72.
[0012] Here, a DCT coefficient consists of a direct-current (DC) component and an alternating current (DC) component, the first DCT coefficient of one piece is a dc component among the generated DCT coefficients of 64 pieces, and the remaining DCT coefficients of 63 pieces are alternating current components. If DCT conversion is given to the picture which consists of a block, in the aforementioned alternating current component, image information will mainly concentrate on a low-frequency component. For this reason, in order to encode in high efficiency by the few number of bits, many numbers of bits are used for the DCT coefficient of a low-frequency component.
[0013] In addition, about a discrete cosine transform, since it is well-known, explanation is omitted.
(The quantization section 72) The quantization section 72 is equipped with the quantization table which consists of a total of width 8 element x length 8 element and 64 elements, generates the quantization DCT coefficient block constituted from a quantization DCT coefficient of 64 pieces by the formula 1, and outputs the quantization DCT coefficient block which generated to a data embedding part 73 using each DCT coefficient which constitutes the DCT coefficient block received from the DCT section 71, and each element of a corresponding quantization table.
(Formula 1)
Quantization DCT coefficient = round (element of a DCT coefficient / quantization table)
Here, round is a function meaning integer-ization to the nearest integer.
[0014] Human being's visual sense is said to have the property of a low pass filter, and is insensible to a high frequency component. Therefore, about a high frequency component, even if it performs a little coarse quantization, the influence is not conspicuous. Therefore, a big value is set to the high frequency component of a quantization table, and a small value is set to it by the low-frequency component. For this reason, the quantization DCT coefficient of a high frequency component can be expressed by the few number of bits, and the quantization DCT coefficient of a low-frequency component is expressed using many numbers of bits.
(Data embedding part 73) The data embedding part 73 has an embedded ending flag. An embedded ending flag is a flag which shows whether the embedding to the quantization DCT coefficient block of the audio bit stream 111 is completed. When an embedded ending flag was OFF, the embedding to the quantization DCT coefficient block of an audio bit stream was not ended, but when an embedded ending flag is ON, the embedding to the quantization DCT coefficient block of an audio bit stream is ended.
[0015] The data embedding part 73 receives a quantization DCT coefficient block from the quantization section 72. Next, since the data embedding part 73 has not ended the embedding to the quantization DCT coefficient block of an audio bit stream when an embedded ending flag judges whether it is set as ON and set as OFF, it performs embedding of the data shown below. Since the embedding to the quantization DCT coefficient block of an audio bit stream is ended when set as ON, embedding of the data shown below is not performed.
[0016] The data embedding part 73 judges whether the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250. When the quantization DCT coefficient block which the data embedding part 73 received judges that it does not exist in the frame field memorized by the frame information table 250, the data embedding part 73 The quantization DCT coefficient of 63 AC (alternating current) components except the quantization DCT coefficient of one DC (direct current) component among the quantization DCT coefficients of 64 pieces of a quantization DCT coefficient block (the quantization DCT coefficient of AC component is hereafter called AC coefficient.) In order of a zigzag scan, it takes out one at a time.

[0017] The data embedding part 73 searches the coefficient number of bits 201 which is in agreement with the number of bits of AC coefficient taken out the account of before from the judgment information table 200, and takes out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement. The absolute value of AC coefficient taken out the account of before is compared with a decision value 203, and it is large, or the direction of the absolute value of AC coefficient makes a part for the number of bits shown by the embedded number of bits 202 from the least significant bit of taken-out AC coefficient the embedded bit embedding other data, in being equal. When the absolute value of AC coefficient is smaller, the embedding of other data does not carry out to taken-out AC coefficient.

[0018] The relation between the number of bits of the quantization DCT coefficient shown in the judgment information table 200 and the embedding position of data is explained using an example shown in drawing 10 . The quantization DCT coefficient which has four kinds of bit length is shown in this drawing. The quantization DCT coefficient 211 consists of a triplet, and the amount of 1 bit becomes the embedded bit 221 from the least significant bit of the quantization DCT coefficient 211. The quantization DCT coefficient 212 consists of 4 bits, and the amount of 1 bit becomes the embedded bit 222 from the least significant bit of the quantization DCT coefficient 212. The amount of 2 bits become the embedded bit 224 from the least significant bit of the quantization DCT coefficient 214 which similarly the amount of 2 bits become the embedded bit 223 from the least significant bit of the quantization DCT coefficient 213 which consists of 5 bits, and consists of 6 bits.

[0019] The data embedding part 73 is transposed to the bit string which took out in order the bit string which has the number of bits shown by the embedded number of bits 202, and took out the aforementioned embedded bit from the audio bit stream 111 memorized by the audio memory 44 the account of before. This replacement is called embedding of a bit string. Next, when the quantization DCT coefficient block which the data embedding part 73 received judges that it exists in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of a quantization DCT coefficient block, the data embedding part 73 is the sequence of a zigzag scan, and takes out every one quantization DCT coefficient of 63 AC components except the quantization DCT coefficient of one DC component.

[0020] The data embedding part 73 is transposed to the bit string which took out in order the bit string which has the number of bits which is in agreement with the number of bits of AC coefficient taken out the account of before, and took out the aforementioned AC coefficient from the audio bit stream 111 memorized by the audio memory 44 the account of before. The relation between the number of bits of AC coefficient and the embedding position of data is explained using an example shown in drawing 11 . The quantization DCT coefficient which has four kinds of bit length is shown in this drawing. The quantization DCT coefficient 216 consists of a triplet, and the taken-out aforementioned bit string is embedded from the audio bit stream 111 in all the bits of the quantization DCT coefficient 216. The quantization DCT coefficient 217 consists of 4 bits, and the aforementioned bit string taken out by all bits is embedded. The same is said of the quantization DCT coefficients 218 and 219.

[0021] The data embedding part 73 outputs the quantization DCT coefficient block containing the quantization DCT coefficient where a part of audio bit stream 111 was embedded to the Huffman coding section 74, after embedding processing of the aforementioned bit string to each AC coefficient is completed. Next, the audio bit stream 111 explains using drawing 12 how it is embedded for the quantization DCT coefficient of the luminance signal Y for one screen. it is shown in this drawing -- as -- the audio bit stream 111 -- bit strings 120, 121, 122, and 123 and ... it constitutes from 124, 125, and ... having -- the quantization DCT coefficient 141 of the luminance signal Y for one screen -- blocks 130, 131, 132, and 133 and ... it consists of 134, 135, and ... the bit strings 120, 121, 122, and 123 contained in the audio bit stream 111, ..., 124 and 125, and ... respectively -- the blocks 130, 131, 132, and 133 of the quantization DCT coefficient 141 of the luminance signal Y for one screen, and ... it is embedded at 134, 135, and ...

[0022] Next, the bit string 123 contained in the audio bit stream 111 explains using drawing 13 how it is embedded at the block 133 included in the quantization DCT coefficient 141 of the luminance signal Y

for one screen. Here, block 133 is a block included to a frame field. The bit string 123 contained in the audio bit stream 111 consists of bit strings 123a, 123b, 123c, 123d, ..., 123e, and the block 133 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen consists of quantization DCT coefficient As C1, AC2, AC3, AC4, ..., AC63 of quantization DCT coefficient-D [of DC component] C, and AC component. Bit strings 123a, 123b, 123c, 123d, ..., 123e are embedded at the quantization DCT coefficient As C1, AC2, AC3, AC4, ..., AC63 of AC component, respectively.
[0023] Next, the bit string 124 contained in the audio bit stream 111 explains using drawing 14 how it is embedded at the block 134 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen. Here, block 134 is a block which is not included to a frame field. The bit string 124 contained in the audio bit stream 111 consists of bit strings 124a, 124b, 124c, 124d, 124e, 124f, and 124g, and the block 134 included in the quantization DCT coefficient 141 of the luminance signal Y for one screen consists of quantization DCT coefficient-D [of DC component] C, quantization DCT coefficient As C1, AC2, AC3, AC4, AC5, AC6, and AC7 of AC component, and ... Bit strings 124a, 124b, 124c, 124d, 124e, 124f, and 124g are embedded at the lower bit of the quantization DCT coefficient As C1, AC2, AC3, AC4, AC5, AC6, and AC7 of AC component, respectively.
[0024] In addition, the reason the data embedding part 73 performs embedding except for the quantization DCT coefficient of one DC (direct current) component among the quantization DCT coefficients of 64 pieces is as follows. difference with the quantization DCT coefficient of DC component by which the quantization DCT coefficient of DC component contained in one quantization DCT coefficient block is contained in the block before one -- it is expressed by the value Therefore, it is because it is thought that the picture which decoded and generated the compression picture encoded by the error by the bit string embedded supposing it performed embedding also for the quantization DCT coefficient of DC component of each block accumulating, influencing [which cannot be disregarded] the quantization DCT coefficient of next DC component temporarily, and doing in this way has high possibility that change clearly with human being's visual senses, and it is visible.
(Huffman coding section 74) Using the quantization DCT coefficient block received from the data embedding part 73, Huffman coding of the Huffman coding section 74 is carried out, and it generates the compression sign train which is a part of compression picture, and writes the generated compression sign train in the memory 35 for signs.
(Memory 35 for signs) The memory 35 for signs memorizes temporarily the compression picture encoded by the coding section 34.
(Memory card I/O section 36) When the compression picture memorized by the memory 35 for signs is written in memory card 20 and the reproduction buttons 21a and 21b are operated by the user, the memory card I/O section 36 reads the compression picture memorized by memory card 20, and writes the read compression picture in the memory 35 for signs.
(Huffman decryption section 84) The Huffman decryption section 84 detects the head code of a block from the compression picture memorized by the memory 35 for signs, Huffman decode of the compression picture is carried out for every block, two or more quantization DCT coefficient blocks which consist of a quantization DCT coefficient of 64 pieces are repeated, it generates and the quantization DCT coefficient block which generated is outputted to the data extraction section 83 and the reverse quantization section 82.
(Data extraction section 83) The data extraction section 83 receives a quantization DCT coefficient block from the Huffman decryption section 84.
[0025] The data extraction section 83 judges whether the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250. When judging that the received quantization DCT coefficient block does not exist in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of the quantization DCT coefficient block received the account of before, the data extraction section 83 is the sequence of a zigzag scan, and takes out every one AC coefficient of 63 pieces except DC coefficient of one piece. As it is shown below from one taken-out AC coefficient, a part of audio bit stream which took out and took out a part of audio bit stream is written in the audio memory 54. The data extraction section 83 repeats

the aforementioned writing to the audio memory 54 at the time of the ability to perform a part of ejection of the aforementioned audio bit stream, and ejection of a part of audio bit stream about AC coefficient of 63 pieces.
[0026] Next, extraction of a part of audio bit stream in the case of judging that it does not exist in the aforementioned frame field is explained. The data extraction section 83 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC coefficient from the judgment information table 200, and takes out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement. The absolute value of AC coefficient taken out the account of before is compared with a decision value 203, and it is large, or the direction of the absolute value of AC coefficient takes out the bit string for the number of bits shown by the embedded number of bits 202 as a part of audio bit stream from the least significant bit of taken-out AC coefficient, in being equal. Since the audio bit stream is not embedded when the absolute value of AC coefficient is smaller, ejection of a bit string is not performed.
[0027] When judging that the received quantization DCT coefficient block exists in the frame field memorized by the frame information table 250, among the quantization DCT coefficients of 64 pieces of the quantization DCT coefficient block received the account of before, the data extraction section 83 is the sequence of a zigzag scan, and takes out every one AC coefficient of 63 pieces except DC coefficient of one piece. One taken-out AC coefficient is made into a part of audio bit stream, and it writes in the audio memory 54. The data extraction section 83 repeats the aforementioned writing to the audio memory 54 at the time of the ability to perform a part of ejection of the aforementioned audio bit stream, and ejection of a part of audio bit stream about AC coefficient of 63 pieces.
Each quantization DCT coefficient which constitutes the quantization DCT coefficient block which the reverse quantization section 82 was equipped with the quantization table which consists of a total of width 8 element x length 8 element and 64 elements, and was received from the Huffman decryption section 84, (Reverse quantization section 82) Using each element of a corresponding quantization table, the DCT coefficient block constituted from a DCT coefficient of 64 pieces by the formula 2 is generated, and the DCT coefficient block which generated is outputted to the reverse DCT section 81.
(Formula 2)
DCT coefficient = the element (reverse DCT section 81) reverse DCT section 81 of a quantization DCT coefficient x quantization table gives a reverse discrete cosine transform using the DCT coefficient which constitutes the DCT coefficient block which received the DCT coefficient block and received from the reverse quantization section 82, and writes some static images which generated and generated some static images in the picture memory 61 for a display.
(Audio memory 54) The audio memory 54 memorizes temporarily the audio bit stream in which decode was carried out by the decryption section 62.
(Audio decryption section 53) The audio decryption section 53 decodes the audio bit stream memorized by the audio memory 54 based on the specification of MPEG1 audio coding, and outputs the voice digital signal which generated and generated the voice digital signal to the voice reproduction section 51.
(Voice reproduction section 51) The voice reproduction section 51 consists of a DA translation circuit, a loudspeaker 11, etc., changes into a voice analog signal the voice digital signal which received and received the voice digital signal from the audio decryption section 53, changes the aforementioned voice analog signal into voice, and is reproduced.
(Picture memory 61 for a display) The picture memory 61 for a display memorizes temporarily the still picture in which decode was carried out by the decryption section 62.
(Image display section 13) The image display section 13 consists of liquid crystal displays etc., and displays the still picture memorized by the picture memory 61 for a display.
1.2 Explain operation of the digital still camera 1 of a digital still camera 1 of operation.
(Operation at the time of photography of a digital still camera 1) Operation at the time of photography of a digital still camera 1 is explained using the flow chart shown in drawing 15 .
[0028] The sound-collecting section 41 collects external voice for 5 seconds from, when a shutter

release 14 is pushed (Step S101), it changes into the electrical signal of an analog the voice which collected the sound, samples the electrical signal of an analog by the 44kHz sampling frequency, changes the electrical signal of each sampled analog into a 8-bit digital signal, and outputs it to the audio coding section 43 (Step S102). Based on the specification of MPEG1 audio coding, compression coding of the aforementioned digital signal with which voice was changed and generated is carried out, and the audio coding section 43 counts bit length m of the audio bit stream 111 which generated and generated the audio bit stream 111, it outputs the generated audio bit stream 111 to the audio memory 44, and outputs bit length m to the data embedding part 73 of the coding section 34 (Step S103).
[0029] On the other hand, the image pck-up section 31 picturizes the exterior as a still picture, when a shutter release 14 is pushed (Step S104). The digitized luminance signal Y which consists the picturized still picture of 640 pixels wide, 480 pixels long, and a total of 307200 pixels It changes into 320 pixels wide, 240 pixels long, and the digitized color-difference signals Cr and Cb that consist of a total of 76800 pixels, respectively, and the luminance signal Y and color-difference signals Cr and Cb for one screen which were digitized are written in the photography image memory 33 (Step S105).
[0030] The coding section 34 performs coding processing, and writes the compression picture which generated and generated the compression picture in the memory 35 for signs (Step S106), and the memory card I/O section 36 writes the compression picture memorized by the memory 35 for signs in memory card 20 (Step S107).
(Operation of the coding section 34) Operation of the coding section 34 is explained using the flow chart shown in drawing 16 .
[0031] As initial value, the value of 0 is set as Variable j (Step S111), the value of 0 is set as Variable k (Step S112), and an embedded ending flag is set to OFF (Step S113). Here, Variable j shows the bit position in audio bit SURITOMU, and Variable k shows the block number in the luminance signal for one screen. A block number shall be counted from the left in order from the right and a top to the bottom in 1 screen.
[0032] The DCT section 71 reads the k-th block in the luminance signal Y101 for one digitized screen which is memorized by the photography image memory 33, generates the DCT coefficient block which read and which gives a discrete cosine transform and consists of DCT coefficients of 64 pieces for every block, and outputs the DCT coefficient block which generated to the quantization section 72 (Step S114).
[0033] Using each DCT coefficient which constitutes the DCT coefficient block received from the DCT section 71, and each element of a corresponding quantization table, the quantization section 72 generates the quantization DCT coefficient block constituted from a quantization DCT coefficient of 64 pieces by the formula 1, and outputs the quantization DCT coefficient block which generated to the data embedding part 73 (Step S115).
[0034] The data embedding part 73 embeds a part of audio bit stream as pad processing outside a frame field at a quantization DCT coefficient block, when it judges whether (Step S116) and the k-th block exist in a frame field when an embedded ending flag is OFF and does not exist in a frame field (Step S120) (Step S117). When it exists in a frame field (Step S120), a part of audio bit stream is embedded as pad processing in a frame field at a quantization DCT coefficient block (Step S121).
[0035] Huffman coding of the Huffman coding section 74 is carried out using the quantization DCT coefficient block received from the data embedding part 73, the compression sign train which is a part of compression picture is generated, and the generated compression sign train is written in the memory 35 for signs (Step S118). It judges by Variable k whether read-out of a block ended the DCT section 71. When larger than all the block counts 4800 contained in the luminance signal Y101 for one screen by which Variable k was digitized, (Step S119), Until it is small, or it ends processing, it returns to (Step S119) and Step S114 when equal, and processing of all blocks is completed Generation of a DCT coefficient block, generation of a quantization DCT coefficient block, **** of an audio bit stream, and Huffman coding are repeated.
[0036] The coding section 34 operates similarly about the luminance signal Y and color-difference signals Cr and Cb for one screen.

(Operation of the data embedding part 73) Operation of the data embedding part 73 is explained using the flow chart shown in drawing 17 and drawing 18 .
[0037] As pad processing outside a frame field, as shown in drawing 17 , the data embedding part 73 sets Variable i as the value of 1 (Step S131). Here, Variable i shows the number of AC coefficient and shows i-th AC coefficient by AC(i). The data embedding part 73 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC(i) from the judgment information table 200. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was a triplet, or when it was 4 bits (Step S132)), Compare a decision value 203 and the absolute value of AC(i) is larger, or in being equal, (Step S151), The value of 1 is added to Variable j (Step S152), and when larger than all bit length m of an audio bit stream (Step S153), Variable j sets ON to an embedding ending flag (Step S155), and ends processing.
[0038] Whether Variable j is smaller than all bit length m of an audio bit stream When equal (Step S153), The bit AB of an audio bit stream (j) is set to 1 bit of the least significant of taken-out AC(i) (Step S154). The value of 1 is added to Variable i (Step S134), Variable i ends processing, when larger than 63 (Step S135), and Variable i returns to Step S132, when [smaller than 63 or] equal (Step S135).
[0039] Here, AB (j) shows the bit of the bit position shown by Variable j within an audio bit stream. The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC(i) is smaller, control is moved to (Step S151) and Step S134.
[0040] The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was 5 bits, or when it was 6 bits (Step S133)), Compare a decision value 203 and the absolute value of AC(i) is larger, or in being equal, (Step S141), The value of 1 is added to Variable j (Step S142), and when larger than all bit length m of an audio bit stream (Step S143), Variable j advances control to Step 155, sets ON to an embedding ending flag (Step S155), and ends processing.
[0041] Whether Variable j is smaller than all bit length m of an audio bit stream When equal (Step S143), The bit AB of an audio bit stream (j) is set to the 2nd bit from the least significant of taken-out AC(i) (Step S144). The value of 1 is added to Variable j (Step S145). Variable j When larger than all bit length m of an audio bit stream (Step S146), The bit AB of an audio bit stream (j) is set to the least significant bit of taken-out AC(i) (Step S147), control is advanced to Step S155, ON is set to an embedding ending flag (Step S155), and processing is ended.
[0042] The bit AB of an audio bit stream (j) is set to the least significant bit of whether Variable j is smaller than all bit length m of an audio bit stream, and AC(i) taken out when equal (Step S146) (Step S148), and control is returned to Step S134. The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC(i) is smaller, control is returned to (Step S141) and Step S134.
[0043] In addition, with the gestalt of this operation, there cannot be no AC coefficient, when AC(i) is not not a triplet but 4 bits (Step S132) and AC(i) is not not 5 bits but 6 bits (Step S133), since either a triplet, 4 bits, 5 bits or 6 bits are taken. As pad processing in a frame field, as shown in drawing 18 , the data embedding part 73 sets Variable i as the value of 1 (Step S171).
[0044] It begins from the bit AB of an audio bit stream (j), the bit string for the number of bits of AC(i) is written in AC(i) (Step S172), and the number of bits of AC(i) is added to Variable j (Step S173). When larger than all bit length m of an audio bit stream (Step S174), Variable j sets ON to an embedding ending flag (Step S177), and ends processing.
[0045] When equal (Step S174), Variable j is smaller than all bit length m of an audio bit stream, or the value of 1 is added to Variable i (Step S175), Variable i ends processing, when larger than 63 (Step S176), and Variable i returns to Step S172, when [smaller than 63 or] equal (Step S176).
(Operation at the time of reproduction of a digital still camera 1) Operation at the time of reproduction of a digital still camera 1 is explained using the flow chart shown in drawing 19 .
[0046] The memory card I/O section 36 reads the compression picture memorized by memory card 20 to the memory 35 for signs, when the reproduction buttons 21a and 21b are operated by the user (Step

S201). The decryption section 62 decodes the compression picture memorized by the memory 35 for signs, generates a still picture and an audio bit stream, writes a still picture in the picture memory 61 for a display, and writes an audio bit stream in the audio memory 54 (Step S202).
[0047] The image display section 13 displays the still picture memorized by the picture memory 61 for a display (Step S203). On the other hand, the audio decryption section 53 decodes the audio bit stream memorized by the audio memory 54 based on the specification of MPEG1 audio coding (Step S204). A voice digital signal is generated and the generated voice digital signal is outputted to the voice reproduction section 51 (Step S205). the voice reproduction section 51 The voice digital signal which received the voice digital signal and was received from the audio decryption section 53 is changed into a voice analog signal, the aforementioned voice analog signal is changed into voice, and it reproduces (Step S206).
(Operation of the decryption section 62) Operation of the decryption section 62 is explained using the flow chart shown in drawing 20 .
[0048] The Huffman decryption section 84 detects the head code of a block from the compression picture memorized by the memory 35 for signs (Step S212), carries out Huffman decode of the compression picture for every block, generates the quantization DCT coefficient block which consists of a quantization DCT coefficient of 64 pieces, and outputs the quantization DCT coefficient block which generated to the data extraction section 83 and the reverse quantization section 82 (Step S213).
[0049] When a quantization DCT coefficient block is received from the Huffman decryption section 84 and a quantization DCT coefficient block does not exist in a frame field (Step S218), as processing outside a frame field, from the quantization DCT coefficient block received the account of before, the data extraction section 83 takes out a part of audio bit stream, and writes a part of taken-out audio bit stream in the audio memory 54 (Step S214). When a quantization DCT coefficient block exists in a frame field (Step S218), as processing in a frame field, from the quantization DCT coefficient block received the account of before, a part of audio bit stream is taken out, and a part of taken-out audio bit stream is written in the audio memory 54 (Step S219).
[0050] Using each quantization DCT coefficient which constitutes the quantization DCT coefficient block received from the Huffman decryption section 84, and each element of a corresponding quantization table, the reverse quantization section 82 generates the DCT coefficient block constituted from a DCT coefficient of 64 pieces by the formula 2, and outputs the DCT coefficient block which generated to the reverse DCT section 81 (Step S215).
[0051] The reverse DCT section 81 gives a reverse discrete cosine transform using the DCT coefficient which constitutes the DCT coefficient block which received the DCT coefficient block and received from the reverse quantization section 82, and writes some static images which generated and generated some static images in the picture memory 61 for a display (Step S216). ** [the Huffman decryption section's 84 detection of the end of read-out of the compression picture memorized by the memory 35 for signs / end / processing / section / (Step S217)] If read-out of the compression picture of the Huffman decryption section 84 is not completed (Step S217), it will return to Step S212 and detection of the head code of a block, generation of a quantization DCT coefficient block, extraction of a part of audio bit stream, generation of a DCT coefficient block, and generation of a picture block will be repeated.
(Operation of the data extraction section 83) Operation of the data extraction section 83 is explained using drawing 21 and the flow chart shown in 22.
[0052] In outside a frame field, as shown in drawing 21 , the data extraction section 83 sets Variable i as the value of 1 (Step S231). Here, Variable i shows the number of AC coefficient and shows i-th AC coefficient by AC(i). The data extraction section 83 searches the coefficient number of bits 201 which is in agreement with the number of bits of taken-out AC(i) from the judgment information table 200. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was a triplet, or when it was 4 bits (Step S232)), Compare a decision value 203 and the absolute value of AC coefficient is larger, or in being equal, (Step S250), The least significant bit of taken-out AC(i) is set to

the audio bit stream AB (j) (Step S251). Add the value of 1 to Variable j (Step S252), and the value of 1 is added to Variable i (Step S234). Variable i ends processing, when larger than 63 (Step S235), and when [smaller than 63 or] equal (Step S235), Variable i returns to Step S232, and repeats extraction of an audio bit stream.

[0053] The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC coefficient is smaller, control is moved to (Step S250) and Step S234. The absolute value of AC (AC(i which took out and took out the embedded number of bits 202 and the decision value 203 corresponding to the coefficient number of bits 201 in agreement when i) was 5 bits, or when it was 6 bits (Step S233)), Compare a decision value 203 and the absolute value of AC coefficient is larger, or in being equal, (Step S240), The 2nd bit is set to the audio bit stream AB (j) from the least significant of taken-out AC(i) (Step S241). The value of 1 is added to Variable j (Step S242), the least significant bit of taken-out AC(i) is set to the audio bit stream AB (j) (Step S243), the value of 1 is added to Variable j (Step S244), and control is moved to Step S234.

[0054] The absolute value of taken-out AC(i) is compared with a decision value 203, and when the absolute value of AC coefficient is smaller, control is moved to (Step S240) and Step S234. In addition, with the gestalt of this operation, there cannot be no AC coefficient, when AC(i) is not not a triplet but 4 bits (Step S232) and AC(i) is not not 5 bits but 6 bits (Step S233), since either a triplet, 4 bits, 5 bits or 6 bits are taken.

[0055] In in a frame field, as shown in drawing 22 , the data extraction section 83 sets Variable i as the value of 1 (Step S271). The data extraction section 83 begins from the bit AB of the audio bit stream 111 (j), writes AC(i) in the bit string for the number of bits of AC(i) (Step S272), and adds the number of bits of AC(i) to Variable j (Step S273). The value of 1 is added to Variable i (Step S274), Variable i ends processing, when larger than 63 (Step S275), and Variable i returns to Step S271, when [smaller than 63 or] equal (Step S275).

1.3 The method shown in the gestalt 1 of the above-mentioned operation was actually applied to the example of application level 640-pixel x perpendicular of 480 pixels, and the full color picture of 8 bits each of RGB.

[0056] In the case of 4 bits or more, in the case of the triplet, the quantization DCT coefficient of a luminance signal and a color-difference signal embedded another data which used the random number for 1 bit of low ranks, and were generated at 2 bits of low ranks of a quantization DCT coefficient. The capacity of the compression picture after embedding 20.5 K bytes of capacity of another data which embedded 75 K bytes of capacity of the compression picture when not embedding another data is 75 K bytes. Therefore, about 27.3% of data were able to be embedded to the capacity of the compression picture after embedding.

1.4 As explained more than the conclusion, it has the embedding field of data as a frame field of the picture circumference, write the watermark information on a constant rate in fields other than a frame field per unit area, and write many quantity of watermark information in a frame field from fields other than the aforementioned frame field per unit area. Moreover, these watermark information is read.

[0057] Thereby, a lot of data can be embedded to a frame field. Although quality-of-image degradation occurs remarkably in a frame field, if it sets up except the main portion of a picture as a frame field, picture degradation will not pose a problem. For example, the center section of the picture should just make a frame field a part for the periphery of the oak which is a main portion, and a picture. In this way, it is effective in adding other data and being able to compress a picture, not causing quality-of-image degradation into the main portions of a picture, but maintaining quality at them.

1.5 Don't restrict the method of spacing other data through other modification (1) image information, and writing in it as information to the method of embedding shown in the gestalt of the above-mentioned operation. You may be other methods.

(2) Write watermark information in fields other than a frame field, and [the gestalt of the above-mentioned operation] though other information is not embedded in any fields other than a frame field, it is good for them.

(3) Although [the gestalt of the above-mentioned operation] speech information is written in a still

picture, it is good though speech information is written in an animation.
(4) The example of the pattern of other frame fields is shown in drawing 23 . In drawing 23 (a), the frame field was established in four corners of a picture, respectively. The circumference of the elliptical portion of the center of a picture was made into the frame field in drawing 23 (b). In drawing 23 (c), the circumference of the heart configuration portion of the center of a picture was made into the frame field. Since it can divide into two or more small rectangle fields, respectively, these frame fields can be expressed as a frame information table 250.
The frame information table 250 is memorized with the frame number which discriminates each frame field for the information which shows two or more frame fields. (5) The data embedding part 73 A frame number is embedded for the quantization DCT coefficient of the first AC component of the quantization DCT coefficient for one screen. the data extraction section 83 It is good, though a frame number is extracted from the quantization DCT coefficient of the first AC component of the quantization DCT coefficient for one screen and one frame field is discriminated from two or more frame fields.
(6) Though the frame information table 250 has memorized the information which shows fields other than a frame field, it is good. In this case, the data embedding part 73 judges whether the received quantization DCT coefficient block exists in fields other than a frame field.
(7) You may set up a frame field which is different the case of a luminance signal, and in the case of a color-difference signal.
(8) The another compression method is sufficient as the audio compression method.
(9) In the gestalt 1 of operation, and the gestalt 2 of operation, although voice is added to a still picture, you may not be voice. You may be the information and music information which show other pictures and an author instead of voice, and text information.
(10) Though one of the another gestalten of operation is the image recording method and the image reconstruction method which are shown by the above, it is good. Moreover, it is good also as a record medium including the program which makes a computer perform the aforementioned method in which computer reading is possible. Furthermore, it is good though the aforementioned program is transmitted through a communication line. Moreover, it is good also as a record medium which is recording the compression picture by which generation was carried out [aforementioned] and in which computer reading is possible.
(11) It is good though the gestalt 1 and the above-mentioned modification of operation are combined, respectively.

[Translation done.]

* NOTICES *

1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is a perspective diagram from the transverse-plane upper part of the digital still camera 1 as a gestalt of one operation of this invention.
[Drawing 2] It is a perspective diagram from the tooth-back upper part of a digital still camera 1.
[Drawing 3] It is the block diagram of a digital still camera 1.
[Drawing 4] It is the block diagram of the coding section of a digital still camera 1.
[Drawing 5] It is the block diagram of the decryption section of a digital still camera 1.
[Drawing 6] The luminance signal Y for one screen memorized by the photography image memory of a digital still camera 1 is shown.
[Drawing 7] An example of the judgment information table of a digital still camera 1 is shown.
[Drawing 8] An example of the frame information table of a digital still camera 1 is shown.
[Drawing 9] An example of the frame field of a digital still camera 1 is shown.
[Drawing 10] It is an example which shows the relation between the number of bits of the quantization DCT coefficient memorized by the judgment information table of a digital still camera 1, and the embedding position of data.
[Drawing 11] It is an example which shows the relation between the quantization DCT coefficient of the frame field of a digital still camera 1, and the embedding position of data.
[Drawing 12] In a digital still camera 1, it is shown how the audio bit stream 111 is embedded for the quantization DCT coefficient of the luminance signal Y for one screen.
[Drawing 13] In a digital still camera 1, the bit string 123 contained in the audio bit stream 111 shows how it is embedded at the block 133 in a frame field.
[Drawing 14] In a digital still camera 1, the bit string 124 contained in the audio bit stream 111 shows how it is embedded at the block 134 outside a frame field.
[Drawing 15] It is the flow chart which shows operation at the time of photography of a digital still camera 1.
[Drawing 16] It is the flow chart which shows operation of the coding section 34 of a digital still camera 1.
[Drawing 17] It is the flow chart which shows operation out of the frame field of the data embedding part 73 of a digital still camera 1.
[Drawing 18] It is the flow chart which shows operation in the frame field of the data embedding part 73 of a digital still camera 1.
[Drawing 19] It is the flow chart which shows operation at the time of reproduction of a digital still camera 1.
[Drawing 20] It is the flow chart which shows operation of the decryption section 62 of a digital still camera 1.
[Drawing 21 </A>] It is the flow chart which shows operation out of the frame field of the data extraction section 83 of a digital still camera 1.
[Drawing 22] It is the flow chart which shows operation in the frame field of the data extraction section

83 of a digital still camera 1.
[Drawing 23] An example of other patterns of a frame field is shown.
[Description of Notations]
11 Loudspeaker
12 Microphone
13 Image Display Section
14 Shutter Release
15 Status-Display Section
17 Finder
18 Lens
19 Memory Card Insertion Mouth
20 Memory Card
21a Reproduction button
21b Reproduction button
31 Image Pck-up Section
33 Photography Image Memory
34 Coding Section
35 Memory for Signs
36 Memory Card I/O Section
37 Decision Value Storage Section
41 Sound-collecting Section
43 Audio Coding Section
44 Audio Memory
51 Voice Reproduction Section
53 Audio Decryption Section
54 Audio Memory
61 Picture Memory for Display
62 Decryption Section
71 The DCT Section
72 Quantization Section
73 Data Embedding Part
74 Huffman Coding Section
81 The Reverse DCT Section
82 Reverse Quantization Section
83 Data Extraction Section
84 Huffman Decryption Section

[Translation done.]